

A TERMINOLOGY FOR THE ANATOMICAL CHARACTERS USEFUL IN THE TAXONOMY OF WEEVIL LARVAE

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INTRODUCTION

Several years ago a comprehensive study of the larvae of Rhynchophora, exclusive of the Scolytidae, Platypodidae, and smaller related families, was undertaken. In the course of the preparation of the descriptions and keys a satisfactory terminology for the taxonomically important characters has developed. Much of the basic terminology involved is not original; it has been adopted from previously published papers dealing with coleopterous larvae, particularly larvae of Rhynchophora. It is the purpose of this paper to demonstrate this terminology in a description and to explain, by means of figures and discussion, the meanings of the terms employed. In future papers, then, it will be possible to avoid continued repetition of explanations of terms the precise meaning of which, in connection with weevil larvae, may not be found in standard glossaries.

Pissodes was chosen for description and illustration for several reasons. Larvae of the genus are moderately large, and the details of structure can be observed without the aid of high magnifications. The genus is approximately centrally located among the weevils, and the larval structures are intermediate between various extremes. At the same time the larvae are sufficiently generalized to illustrate most of the characters found to be valuable in classifying weevil larvae. In order to demonstrate the terminology as completely as practicable, the following description contains characters of family and subfamily importance as well as those of generic value. A typical generic description would be confined to a discussion of characters considered diagnostic for a given genus.

PISSODES Germar

Head free,¹ dark orange, lighter in paired dorsal and lateral stripes, as broad as long,* broadest at the middle, rounded posteriorly. Anterior ocellus* present. Posterior ocellus absent. Antenna* consisting of one membranous article which bears a conical accessory sensory appendage and several minute setae. Catapophyses* in same plane as frons. Hypopharyngeal bracon* readily discernible. Frontal suture* distinguishable throughout its length, incomplete anteriorly. Epicranial suture (fig. 8, ES) more than one-half as long as head. Endocarina* distinct, approximately one-half as long as frons. Frons* with five pairs of setae, setae

¹Terms marked with an asterisk are explained in the Definitions of Terms.

1, 2 and 3 short to moderately long, subequal, 4 and 5 long, subequal. Dorsal epicranial setae^o 1, 3 and 5 long, subequal, 2 moderately long, 4 short. Lateral epicranial seta* 1 moderately long, 2 long. Ventral epicranial setae^o short to moderately long, subequal. Four minute posterior epicranial setae^o present. Clypeal seta^o 1 short to moderately long, nearly twice as long as 2. Anterior margin of labrum* transverse. Labral setae* 1 and 2 short to moderately long, nearly twice as long as 3. Median and paired lateral sensilla^o present on labrum. Labral rods^o moderately elongate, stout, subparallel. Epipharynx with three anterolateral^o and six anteromedian^o setae and four median spines.^o Epipharyngeal sensory pores^o in two clusters, two or three in each cluster, between the anterior and posterior pairs of median spines. Epipharynx without asperities.* Mandible with two apical teeth. Mandibular seta* 1 short, slightly longer than and directly behind 2. Labial palpus with two articles. Premental sclerite* complete, with anterior and posterior median extensions. Postmentum^o with three pairs of setae, the posterior pair separated by a distance approximately one-half as great as that between setae of middle pair. Lateral margin of stipes, in the vicinity of basal seta, with a flattened projection. Maxillary palpus* with two articles, the basal article without accessory process, with one very short lateral seta, the apical article without lateral seta. Mala* with five ventral and seven dorsal setae.

Pronotum^o with 11 setae. Thoracic spiracle bicameral.^o Spiracular area* of mesothorax with two setae, one moderately long, one very short. Prodorsum^o of mesothorax and metathorax with one short seta. Postdorsum* of mesothorax and metathorax with four setae, setae 1 and 2 short, subequal, 3 and 4 moderately long, subequal. Alar area* with one short seta. Pedal area* with seven setae, one moderately long, the remainder shorter. Most ventral seta of pedal area subequal to very short sternal seta.* Sternal setae subequal to eusternal setae.*

Abdomen with eight pairs of spiracles. Spiracles all lateral, bicameral, the air tubes* subequal in length to diameter of subcircular peritreme,* each spiracle with crescent-shaped sclerite dorsoposteriorly. Typical abdominal segments* with three dorsal folds,* fold I developed laterally. Prodorsum of typical abdominal segments with one short seta. Postdorsum of typical abdominal segments with five setae, setae 1, 2 and 4 short, 3 and 5 moderately long, subequal. Spiracular area with two setae, seta 1 very short, seta 2 short. Epipleurum^o with two setae, one short, the other slightly longer. Pleurum* with two setae, one short, the other slightly longer. Pedal area with one short seta. Eusternum* with two very short setae. Sternellum* present. Anus terminal.^o Asperities* generally distributed over whole body, moderately distinct, slender and pointed.

DEFINITIONS OF TERMS

Air tube: see Spiracle.

Alar area (fig. 11, A1A): An area or lobe nearly always discernible on

each side of both mesothorax and metathorax. It lies immediately lateral to postdorsal area of each of these segments and is delimited both dorsally and laterally by more or less complete diagonal grooves. Each alar bears typically one or two *setae of alar area*.

Antenna (fig. 8, Ant and fig. 10): The antenna nearly always consists of a membranous, cushionlike, *basal article* (fig. 10, art) which usually bears several minute setae or processes and an *accessory sensory appendage* (fig. 10, acap). The latter does not bear setae or appendices of any kind and therefore is not to be considered as an article.

Anus (fig. 13): The anus is surrounded by the *lobes of anus* (fig. 13, AnL) which are the remnants of abdominal segment X. When the anus is located approximately in the center of the posterior end of body it is referred to as *terminal*.

Asperities: Minute, usually colorless, pointed or blunt projections from membranous areas of the body.

Bicameral: see Spiracle.

Catapophysis (fig. 9, Cat): The mandible has two points upon which it swings. Obviously there are at the same time two points on the head which oppose those on the mandible. It appears, however, that no satisfactory term has been applied to that portion of the head capsule which fits into a more or less distinct fossa on the dorsal surface of the mandible. It is a projection, and since it exerts a pressure downward against the mandible, the term *catapophysis* (plural: *catapophyses*) is proposed for it. In the large majority of larvae it consists of an unimpressive extension of the extreme anterior border of frons just lateral to or closely connected to the posterolateral corner of clypeus. In other groups the *catapophysis* is more sharply defined. It consists of a partly globular projection on the inner surface of the extreme anterior margin of frons and its margin, against which the mandible pivots, forms an arc of a circle.

Clypeal seta: see Clypeus.

Clypeus (fig. 8, Cl and fig. 1): The clypeus nearly always bears two setae and a sensillum (fig. 1, clsl) on each side near base. The seta nearest the middle line is referred to as *clypeal seta 1* (fig. 1, clsl), the other as *clypeal seta 2* (fig. 1, clsl2).

Dorsal epicranial seta: see Epieranium.

Dorsal fold: The dorsum of each segment of the body, except prothorax and abdominal segments IX and X, is divided by one or more transverse grooves into two or more folds. In larvae of all weevils the dorsum of mesothorax and metathorax is divided into two folds. In larvae of certain groups of weevils the typical abdominal segments are likewise divided into two folds. This number seems to be basic and any increase in the number to be the result of subdivision. When the abdominal segments have two folds each fold bears one or more setae, as on the two posterior thoracic segments. In order

to be able to refer to these setae it has been found convenient to name the anterior fold the *prodorsum* (fig. 11, PrD), bearing the *prodorsal setae* (figs. 11, 12, prs), and the posterior fold the *postdorsum* (fig. 11, PsD), bearing the *postdorsal setae* (the latter discussed more fully below). When more than two folds are present the setae are confined to those which are homologous to the basic prodorsum and postdorsum.

The number of folds (two, three, four or five) on the typical abdominal segments is often of considerable value in the classification. It is necessary to use the character with caution, however, since each condition intergrades into the next. For descriptive purposes it has been found desirable to designate each fold by number. For reasons which will become evident, the basic prodorsum is designated as *fold II* (fig. 12, FldII) and postdorsum as *fold IV* (fig. 12, FldIV). When three folds are present at the middorsal line it is apparent that *fold III* (fig. 12, FldIII) has developed between fold II and fold IV. When *fold I* (fig. 12, FldI) is present it is usually discernible only laterally (as in *Pissodes*) but when completely developed it extends to the middorsal line. The condition in which five folds are present at the middorsal line is not common. When *fold V* is present, however, it can be shown to develop at the posterior end of the segment, behind the postdorsum. The homologies of each fold can be understood from a study of the muscles but it is not the purpose of this discussion to trace those homologies.

Endocarina (fig. 8, Ene): A usually dark-colored median line discernible on frons of most groups of weevils. When present it extends forward from apex of frons.

Epicranium: The head capsule, exclusive of frons, is referred to as epicranium. For taxonomic purposes the setae on epicranium have been divided into four moderately easily defined groups which are: (1) *Dorsal epicranial setae* (fig. 8, des1 to des5). There are nearly always five pairs of dorsal setae on epicranium which are usually of some length, in the same relative arrangement as in *Pissodes* and given corresponding numbers. (2) *Lateral epicranial setae* (fig. 8, les1, les2). There are, with few exceptions, two setae which extend outward from each lateral surface of epicranium, before the middle, numbered as in *Pissodes*. (3) *Ventral epicranial setae* (fig. 9, ves1, ves2). There are two pairs of setae on ventral surface of epicranium which are in the same relative position and given the same numbers as in *Pissodes*. (4) *Posterior epicranial setae* (Fig. 8, pes). These are present on nearly all larvae and are very short to minute.

Epipharynx (fig. 9, Epx and fig. 3): The epipharynx bears three well-defined groups of setae which are nearly always constant in number for a given species or group of species. These are (1) *Anterolateral setae* (fig. 3, als) near anterior margin, lateral to base of each labral rod. In descriptions only the number on one side is given.

(2) *Anteromedian setae* (fig. 3, ams) near anterior margin, between the bases of labral rods. In descriptions the total number is given.

(3) *Median spines* (fig. 3, msp) between the labral rods, posterior to the anteromedian setae. In descriptions the total number is given.

On epipharynx, between the labral rods, there are also, with rare exceptions, two clusters of sensilla, the *epipharyngeal sensory pores* (fig. 3, snp).

Epipleurum (figs. 11, 12, EPl): An area or lobe which lies immediately above the dorso-pleural line on mesothorax, metathorax and abdominal segments I to VIII. It is nearly always below the spiracle, when the latter is present, and is separated from spiracular area by a more or less obvious groove. Each epipleural lobe bears one or more setae, the *epipleural setae* (figs. 11, 12, eps1, eps2).

Eusternal seta: see Ensternum.

Eusternum (fig. 12, EnSt): A subtriangular area nearest the anterior margin on the ventral surface of abdominal segments I to VIII. It is not distinguishable on the larvae of some groups in which the sternum is not subdivided. The eusternum usually bears two setae, the *eusternal setae* (figs. 11, 12, eus1, eus2) on each side of the midventral line and in descriptions only the setae on one side are mentioned.

Frons (fig. 8, Fr.): The triangular or subtriangular area on the anterior dorsal surface of head, limited posteriorly and laterally by the frontal sutures (fig. 8, FS). It bears the *frontal setae* (fig. 8, fs1 to fs5). Frontal seta 4 (fig. 8, fs4) is present consistently and, in nearly all groups of Curculionidae is as long as or longer than any of the other frontal setae. Its relative position is constant. Therefore, when fewer than five pairs of setae are present on frons, a prominent seta in the same relative position is referred to as frontal seta 4.

Frontal suture (fig. 8, FS): In some groups of Rhynchophora each frontal suture extends anteriorly to the articulating membrane of the mandible and is referred to as *complete*. In most groups, however, the suture is not distinguishable beyond the antenna and is referred to as *incomplete*.

Head, free: If all or nearly all the head capsule is visible in well-preserved larvae, without dissection, the head is considered to be free, as opposed to retracted (see below). When free the head is usually pigmented posteriorly and, in dorsal view, the posterior margin is often broadly rounded or transverse.

Head, length: The length of the head is measured from its posterior margin to the anterior margin of frons.

Head, retracted: The posterior part of the head capsule in certain genera or groups of genera is embedded in prothorax and cannot be observed in properly preserved larvae without dissection. In these cases the head is referred to as retracted. The posterior part of the head is usually not pigmented, the principal setae are in front of

the middle of the head and, in dorsal view, the posterior margin of the head is often oval to broadly oval.

Hypopharyngeal bracon (fig. 9, HB): A transverse brace, immediately behind the fossae for mandibles, usually visible in a ventral view of the head after removal of the mouthparts.

Labium (fig. 2): The labium consists of two subdivisions, *prementum* (fig. 2, PrMt) and *postmentum* (fig. 2, PMt). The prementum is the distal portion of the labium from which the labial palpi arise. It is bounded posteriorly by the *premental sclerite* (fig. 2, PrmS) which is usually pigmented and often has the shape of a trident. The postmentum, the proximal portion of the labium, is usually membranous and nearly always bears three pairs of setae, the *postmental setae* (fig. 2, pms1 to pms3).

Labral rod (fig. 3, LmR): In the majority of larvae the most conspicuous feature of the epipharynx is a pair of dark-colored, rodlike structures, the *labral rods*. They are the epipharyngeal rods of authors. Although most readily visible in a view of epipharynx they are basically a part of labrum from which they arise.

Labral seta: see Labrum.

Labrum (fig. 8, Lm and fig. 1): The labrum usually bears three pairs of setae, the *labral setae* (fig. 1, lms1 to lms3). In descriptions they are referred to by number, the numbers agreeing with those indicated for *Pissodes*. Also on labrum are found, rather uniformly, a pair of *lateral sensilla* (fig. 1, lsl) and often one *median sensillum* (fig. 1, msl). The *anterior margin of labrum* may be straight or smoothly rounded or that portion between the bases of the labral rods may be slightly produced or slightly to obviously emarginate.

Lateral epicranial seta: see Epicranium.

Mala (fig. 2, Ma and fig. 5): The maxillary mala is provided with setae along its inner margin. Those the base of which is visible in a ventral view of mala, are arbitrarily called *ventral setae of mala* (fig. 5, vsm). Those apparently arising on the dorsal surface and usually arranged in an evident row, are referred to as the *dorsal setae of mala* (fig. 5, dsma).

Mandibular seta (fig. 4, mds1, mds2): On the outer surface of mandible there are nearly always two setae, referred to in descriptions as the mandibular setae. The more posterior or more dorsal seta is referred to as *mandibular seta 1* (fig. 4, mds1) the other as *mandibular seta 2* (fig. 4, mds2).

Maxillary palpus (fig. 5, MxP): The maxillary palpus nearly always consists of two readily distinguishable articles. The basal article bears a short to minute seta on ventral inner surface. In some larvae a free, rodlike *accessory process of maxillary palpus* arises from the dorsolateral surface of apex of basal article. In most larvae, however, this process has become fused with the apical article and its connection with basal article obliterated.

Ocellus (fig. 8, Oc): In most larvae there is a convex lens on each side

of the head just lateral or posterolateral to antenna. This is referred to as the *anterior ocellus*. In some groups there is a second ocellus, the *posterior ocellus* located dorsolaterally on each side of the head, before the middle. Unless a convex lens is clearly discernible, even though a subcutaneous pigment spot may be visible, the ocellus is considered to be absent.

Pedal area (figs. 11, 12, PdA): A subtriangular area on each side of the midventral line of thoracic segments and, nearly always, abdominal segments I to VII. The apex of the triangular area is toward the midventral line. Each pedal area, on thorax, bears several setae and, on abdomen, usually bears one seta.

Peritreme: see Spiracle.

Pleurum (fig. 11, Pl): An area or lobe which lies immediately below the dorsopleural line on the thoracic segments and abdominal segments I to VIII. Each pleural lobe may bear one or, more commonly, two setae, the *pleural setae* (figs. 11, 12, ps1, ps2).

Postdorsal seta (figs. 11, 12 pds1 to pds5): The setae on postdorsum of mesothorax, metathorax and abdominal segments I to VIII have been assigned numbers in order that each seta may be referred to when desirable. No attempt has been made to homologize the setae in the various tribes and subfamilies. The seta on each postdorsal area which is nearest the middorsal line is referred to as postdorsal seta 1 (fig. 11, pds1); the seta lateral to seta 1 is referred to as seta 2 (fig. 11, pds2) and so forth. In descriptions, when the number of setae on postdorsum is given, only the number on one side of the middorsal line is indicated.

Postdorsum: see Dorsal fold.

Posterior epicranial seta: see Epicranium.

Postmentum: see Labium.

Premental sclerite: see Labium.

Prodorsum: see Dorsal fold.

Pronotum (fig. 11, DPt): The dorsum of prothorax, or pronotum, is not differentiated into easily interpreted subareas and is treated as a unit. It is considered as extending laterally as far as the level of mesothoracic spiracle. When the number of setae is given, that number applies to the setae on one side of the middorsal line only.

Sensillum of labrum: see Labrum.

Spiracle (figs. 11, 12, Sp and Fig. 7): Each spiracle consists of a basal collarlike *peritreme* (fig. 7, Prt) with or without finger-shaped, annulated or non-annulated *air tubes* (fig. 7, ATb). A spiracle with a single air tube is described as unicameral; one with two air tubes as bicameral.

Spiracular area (fig. 11, SpA): A usually poorly defined area in the vicinity of each spiracle or, on metathorax, rudimentary spiracle. The spiracular area usually lies above and behind the spiracle and bears the *setae of spiracular area* (figs. 11, 12, ss1, ss2).

Sternal seta: see Sternum.

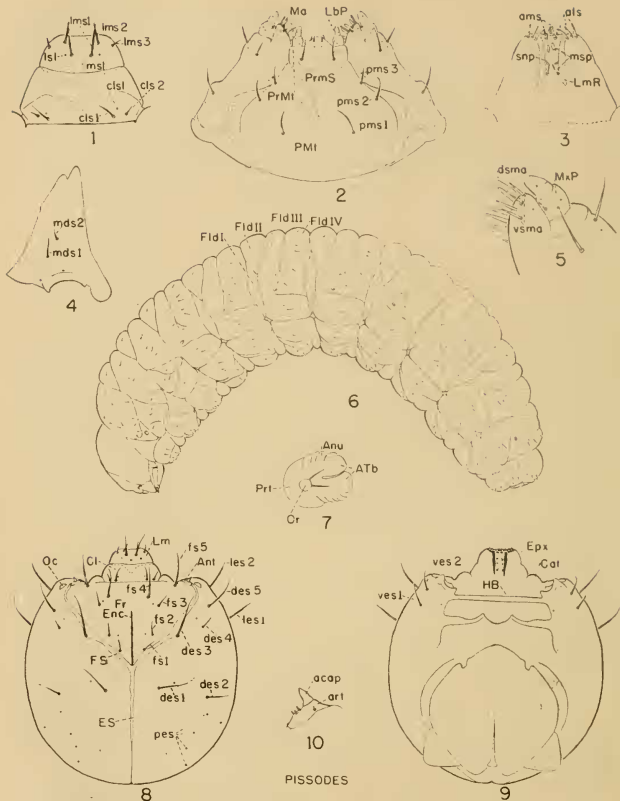


Fig. 1. *Pissodes strobi* (Peck), clypeus and labrum. Fig. 2. *P. fasciatus* Lec., labium and maxillae, ventral view. Fig. 3. *P. strobi*, epi-pharynx. Fig. 4. *P. strobi*, mandible, lateral view. Fig. 5. *P. strobi*, apex of maxilla, ventral view. Fig. 6. *P. fasciatus*, lateral view. Fig. 7. *P. fasciatus*, first abdominal spiracle. Fig. 8. *P. strobi*, head, dorsal view. Fig. 9. *P. strobi*, head, ventral view, mouthparts removed. Fig. 10. *P. strobi*, left antenna, dorsal view. (Drawn by author.)

Sternellum (figs. 11, 12, Stn): The posterior transverse fold on the ventral surface of abdominal segments I to VII. It is not distinguishable in certain groups of Rhynehophora. When present it does not bear setae.

Sternum (fig. 11, St): A typically subtriangular area nearest the anterior margin on the ventral surface of each thoracic segment. The sternum usually bears one seta, the *sternal seta* (fig. 11, sts) on each side of the midventral line and in descriptions only the seta (or rarely setae) on one side is mentioned.

Typical abdominal segment: Abdominal segments II to VI are usually identical in so far as areas and arrangements of setae are concerned and are referred to as typical. The areas and setae on segments I and VII may or may not be identical with those on segments II to VI.

Unicameral: see Spiracle.

Ventral epicranial seta: see Epieranium.

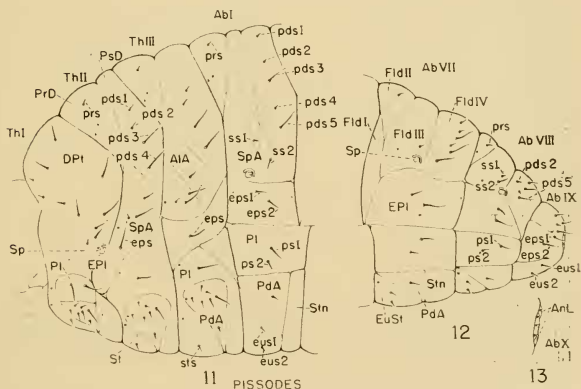


Fig. 11. *Pissodes strobi*, thoracic and first abdominal segments, semi-diagrammatic. Fig. 12. *P. strobi*, abdominal segments VII to X, semi-diagrammatic. Fig. 13. *P. strobi*, abdominal segment X. (Drawn by author.)

EXPLANATION OF LETTERING ON FIGURES

AbI to AbX, abdominal segments	les1, les2, lateral epicranial setae
acap, accessory sensory appendage of antenna	Lm, labrum
ALA, alar area	LmR, labral rod
als, anterolateral setae of epipharynx	lms1 to lms3, labral setae
ams, anteromedian setae of epipharynx	lsl, lateral sensillum of labrum
AnL, lobes of anus	Ma, mala
Anu, annulus of spiracular air tube	m ds1, m ds2, mandibular setae
art, basal article of antenna	msl, median sensillum of labrum
ATh, air tubes of spiracle	m sp, median spines of epipharynx
Cat, catapophysis	MxP, maxillary palpus
Cl, clypeus	Oe, ocellus
cls1, cls2, clypeal setae	Or, orifice of spiracle
cls1, clypeal sensillum	PdA, pedal area
des1 to des5, dorsal epicranial setae	p ds1 to p ds5, postdorsal setae
DPt, pronotum or dorsum of prothorax	pes, posterior epicranial setae
dsma, dorsal setae of mala	Pl, pleurum
Ene, endocarina	pms1 to pms3, postmental setae
EPl, epipleurum	PMt, postmentum
eps1, eps2, epipleural setae	PrD, prodorsum
Epx, epipharynx	PrMt, prementum
ES, epicranial suture	PrmS, premental sclerite
eus1, eus2, eusternal setae	prs, prodorsal setae
EuSt, eusternum	Prt, peritreme of spiracle
FldI to FldIV, folds of abdominal segments	ps1, ps2, pleural setae
Fr, frons	PsD, postdorsum
fs1 to fs5, frontal setae	sup, sensory pores of epipharynx
FS, frontal suture	Sp, spiracle
HB, hypopharyngeal bracon	SpA, spiracular area
LbP, labial palpus	ss1, ss2, setae of spiracular area
	St, sternum
	Stn, sternellum
	sts, sternal seta
	ThI to ThIII, thoracic segments
	ves1, ves2, ventral epicranial setae
	vsma, ventral setae of mala